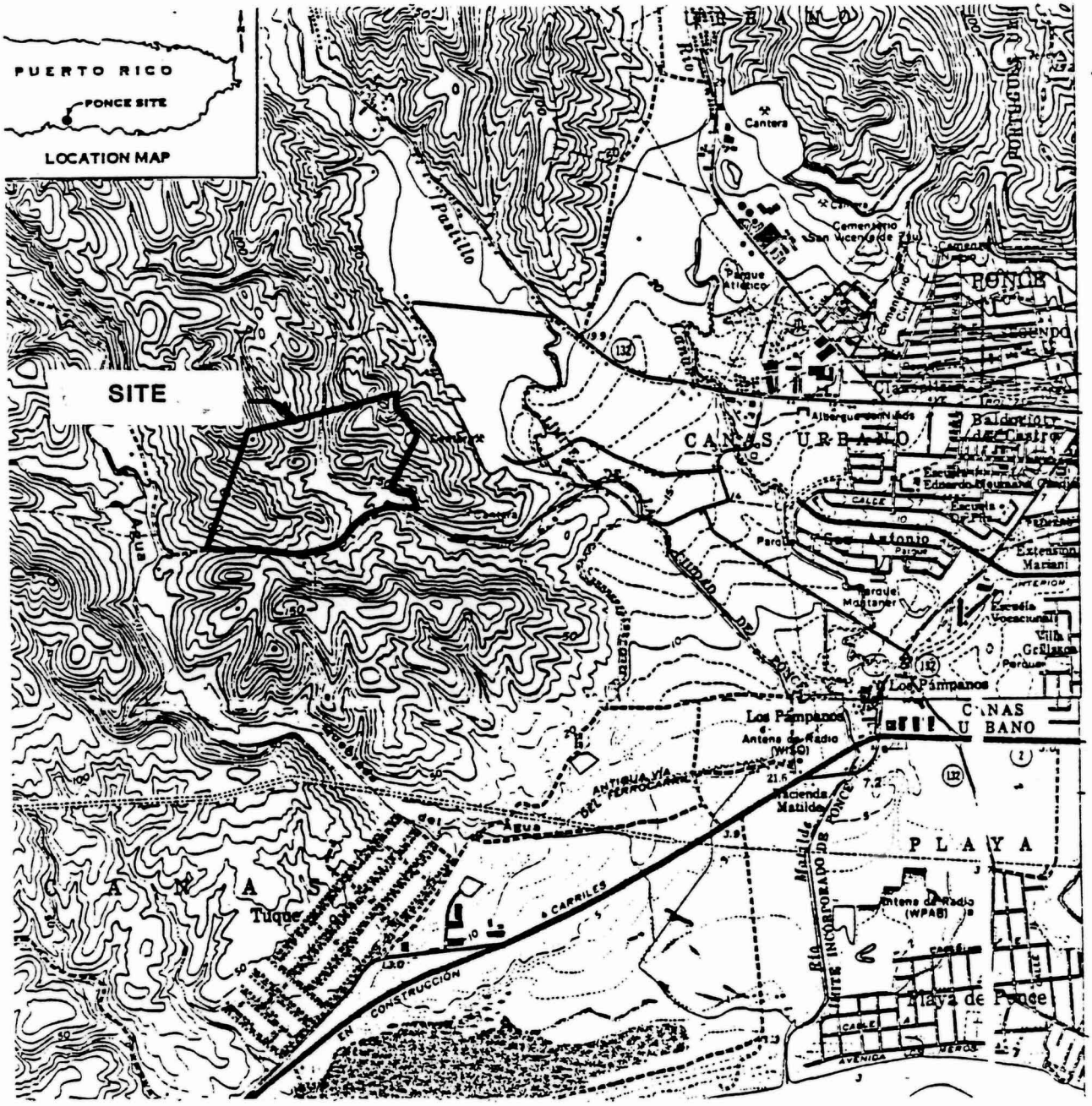

LEGEND

— 100 — TOPOGRAPHIC CONTOUR INTERVAL = 10 METERS

REF:

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MILES 0 1

KILOMETER 0 1

SCALE

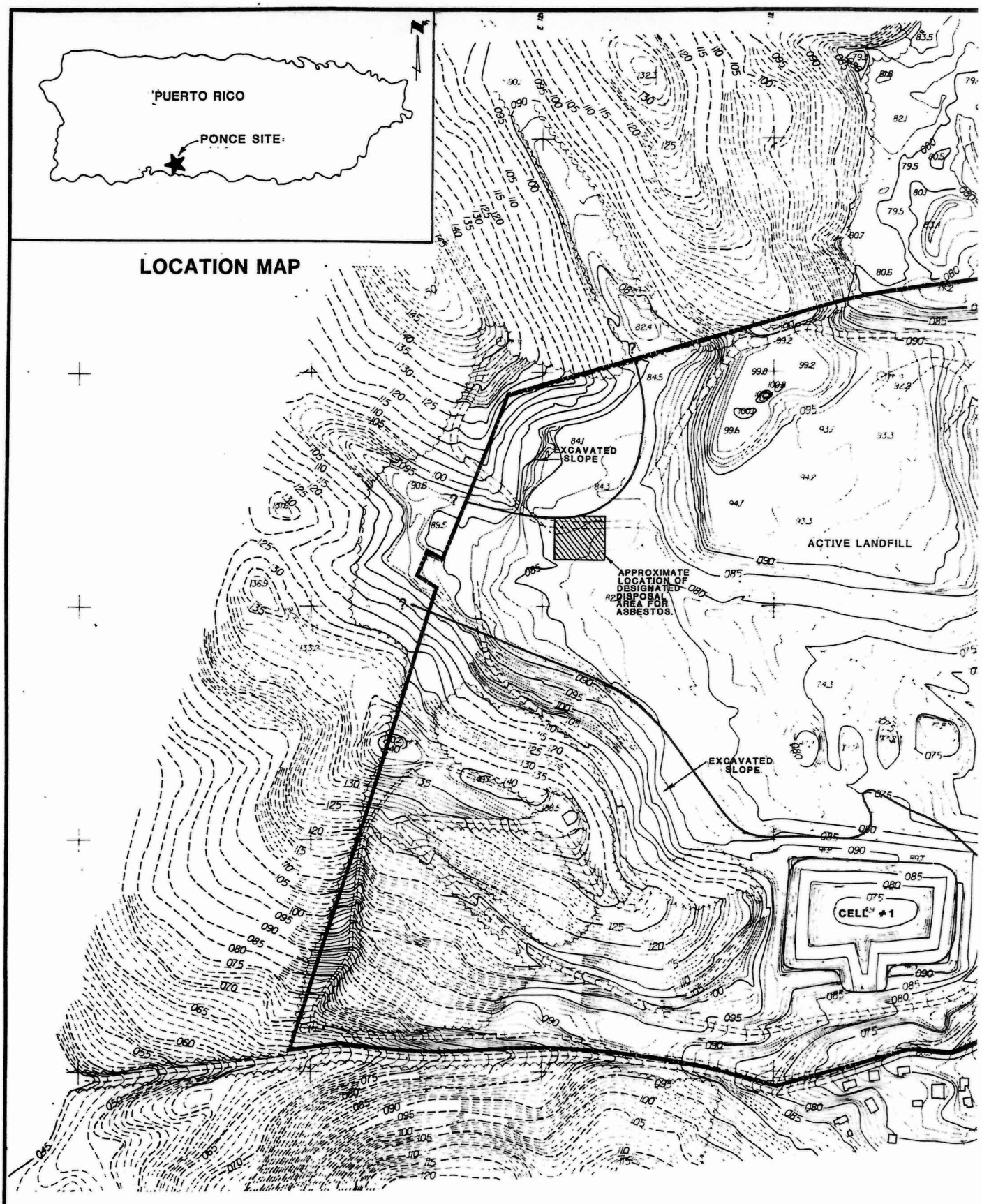
Golder Associates, Inc.
Atlanta, Georgia

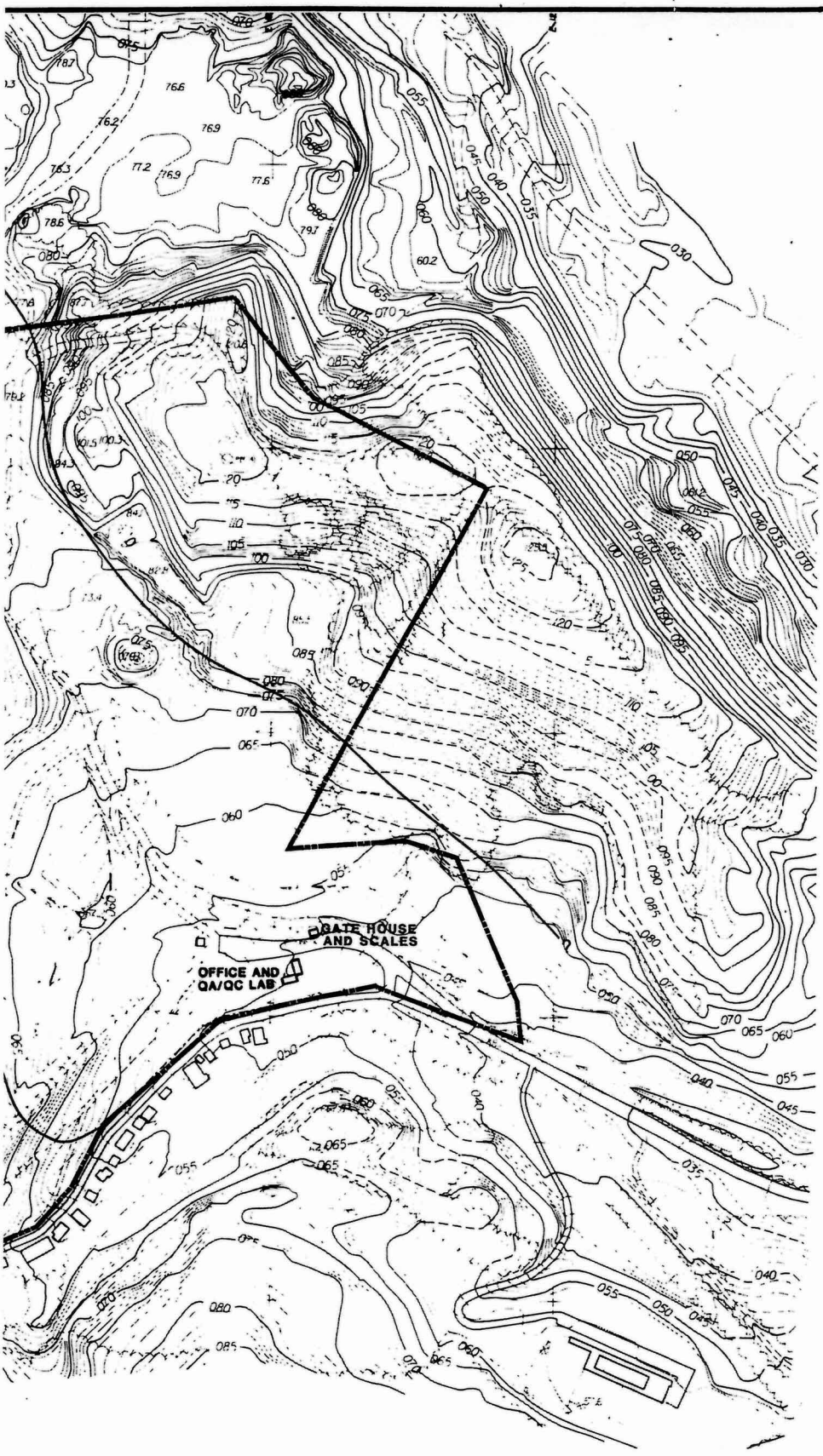
TITLE: SITE LOCATION MAP FOR PONCE MUNICIPAL LANDFILL

CLIENT/PROJECT: BFI OF PONCE, INC.

DRAWN	CHECKED	REVIEWED	DATE	SCALE	JOB NO.
DRC	SDS	WRS	6/25/88	AS SHOWN	883-3643

FILE NO.	DWG. NO. / REV. NO.	FIGURE
883-3643	2	1


PUERTO RICO
PONCE SITE
LOCATION MAP
EXCAVATED SLOPE
ACTIVE LANDFILL
APPROXIMATE LOCATION OF DESIGNATED DISPOSAL AREA FOR ASBESTOS.
EXCAVATED SLOPE
CELL #1



LEGEND

— APPROXIMATE BOUNDARIES OF LANDFILL

▬ SITE BOUNDARY

100 TOPOGRAPHIC CONTOUR = 1 METER INTERVALS

NOTE:
BASE MAP PREPARED FROM FEB.,1988 AERIAL PHOTOS.

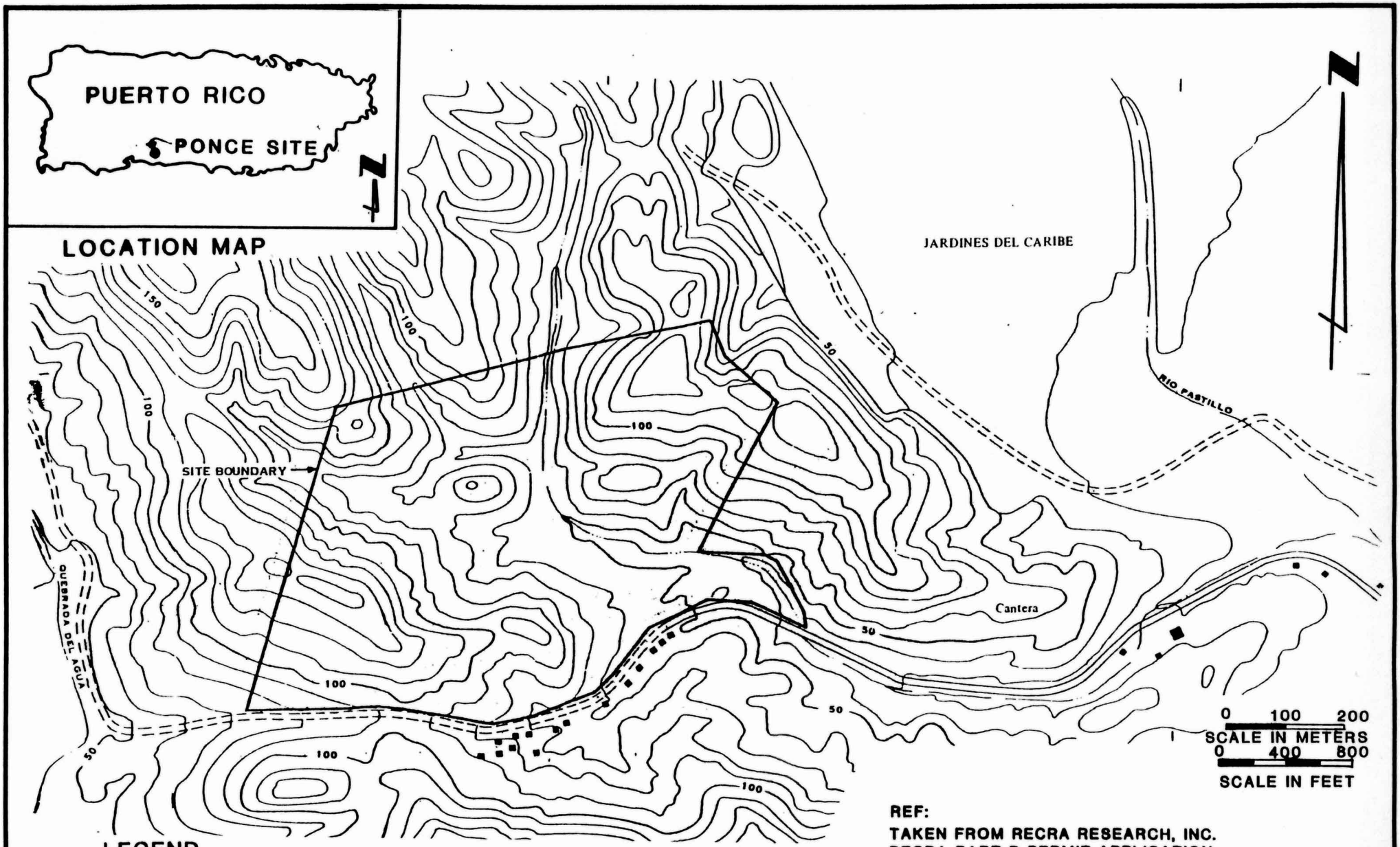
SCALE IN METERS
50 0 50 100 150
1:2000

REVISIONS		
DESCRIPTION	BY	DATE
REVISION 1	DRC	

BFI OF PONCE, INC.

TITLE
SITE PLAN FOR PONCE MUNICIPAL LANDFILL

DRAWN DRC	SCALE AS SHOWN	DATE 6/29/88
CHECKED SDS	REVIEWED WRS	JOB NO. 883-3643
Golder Associates		DWG NO 3
		FIGURE 2



REF:
TAKEN FROM RECRA RESEARCH, INC.
RECRA PART B PERMIT APPLICATION.
PENNELAS, P.R. 7 1/2" QUADRANGLE
U.S.G.S. PHOTO REVISED 1982.

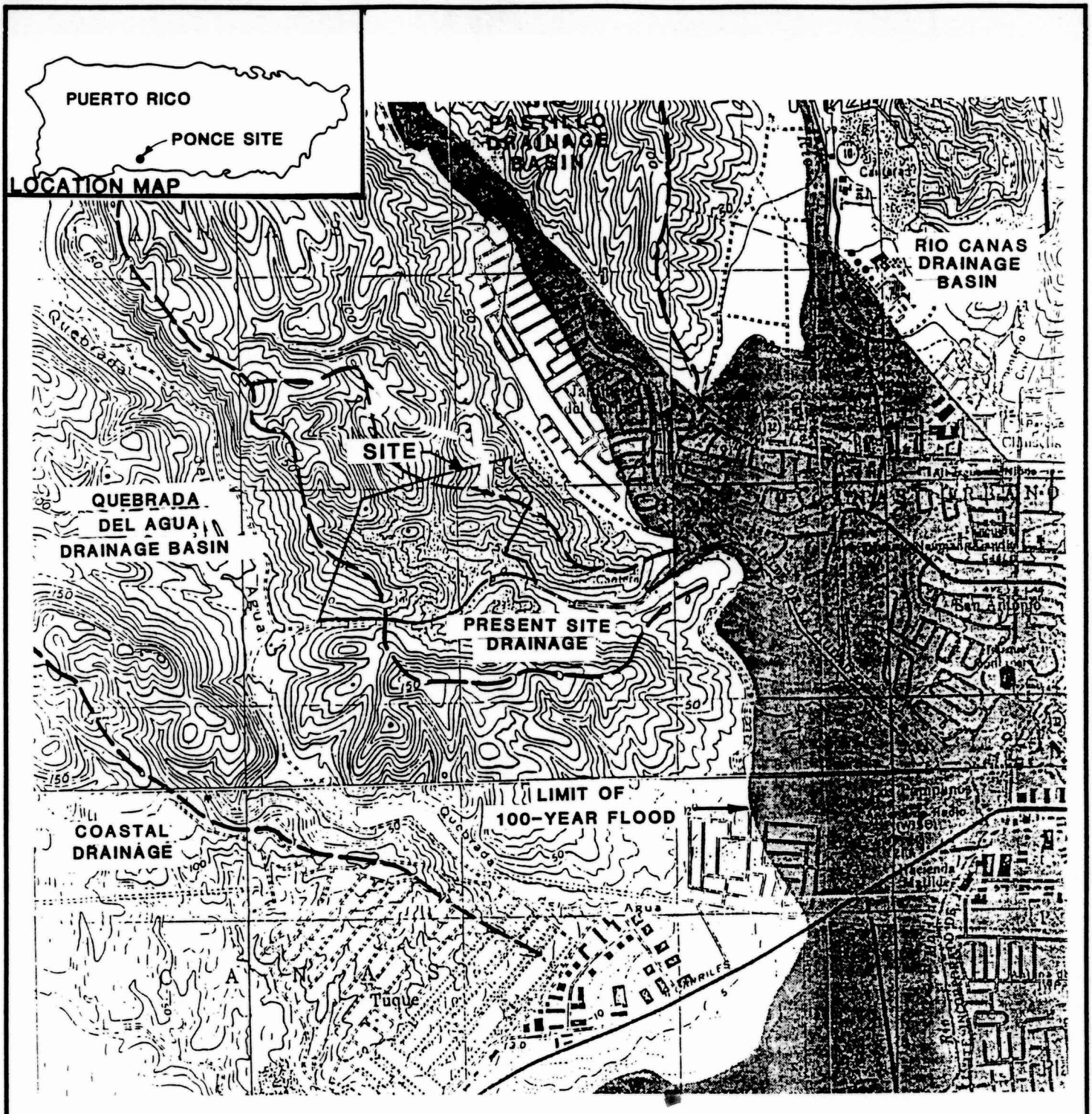
LEGEND

~100~ TOPOGRAPHIC CONTOUR INTERVAL =10 METERS

CLIENT/PROJECT: BFI OF PONCE, INC.	Golder Associates Atlanta, Georgia					TITLE: ORIGINAL SITE TOPOGRAPHY		
DRAWN: DRC	CHECKED: ALG	REVIEWED: WRS	DATE: 11/9/88	SCALE: AS SHOWN	JOB NO.: 883-3643	FILE NO.: 883-3643	DWG. NO / REV. NO.: 4	FIGURE: 3

306457

305301



-100- TOPOGRAPHIC CONTOUR
INTERVAL = 10 METERS

REF:
TAKEN FROM RECRA RESEARCH, INC.
RCRA PART B PERMIT APPLICATION.

0 1000 2000 3000 FEET
0 500 1000 METERS

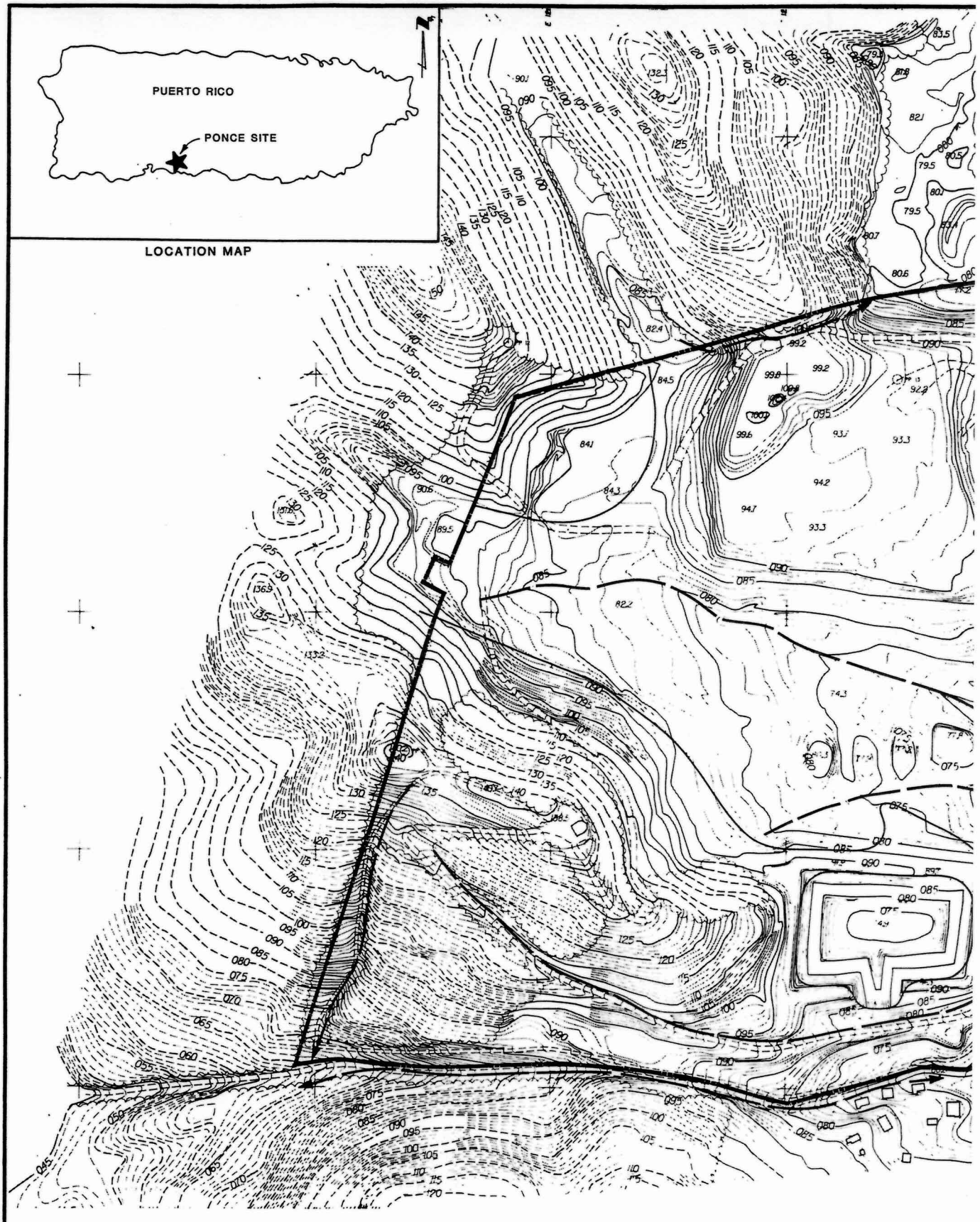
Golder Associates, Inc.
Atlanta, Georgia

CLIENT/PROJECT
BFI OF PONCE, INC.

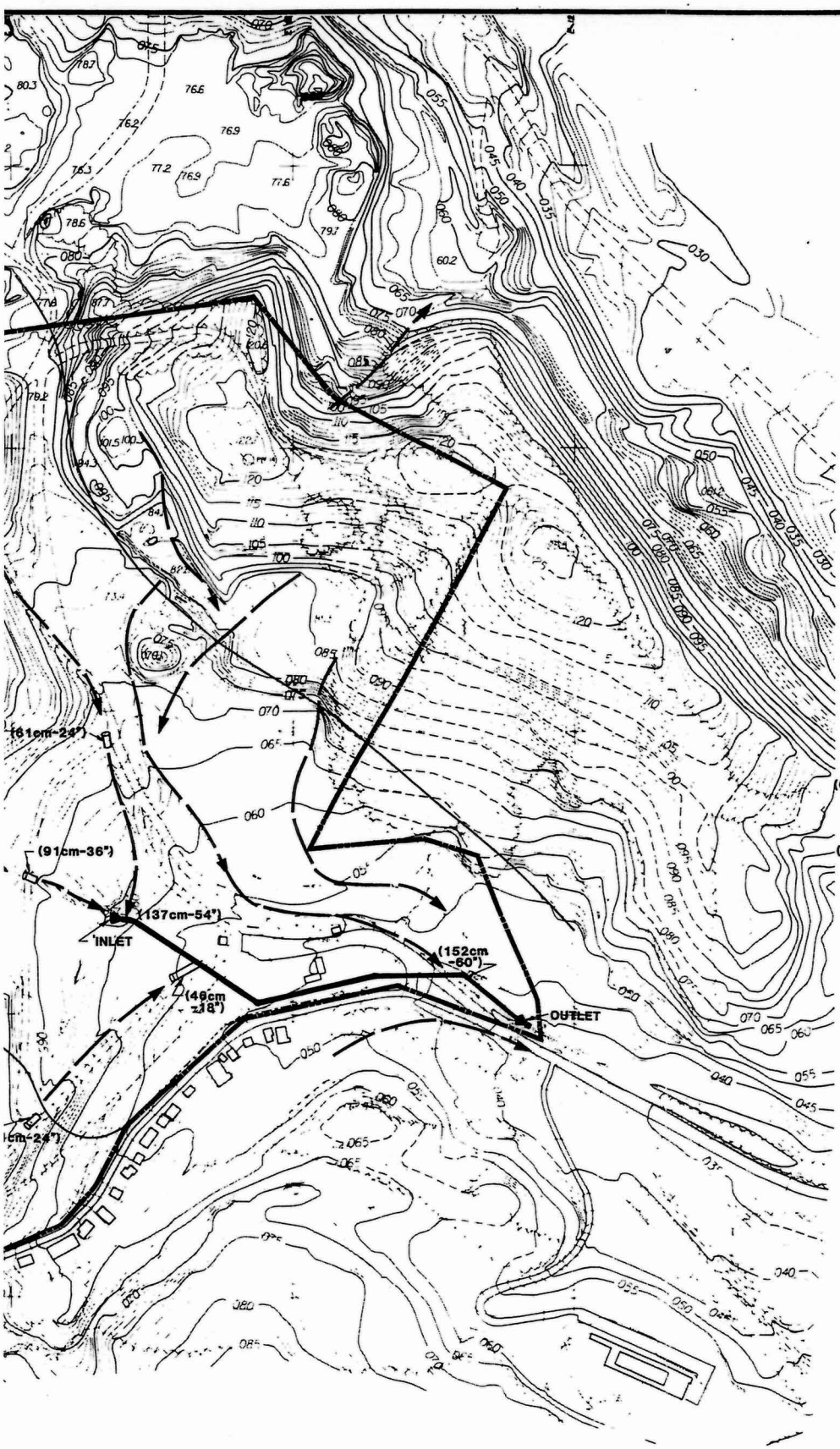
TITLE
SURFACE WATER/FLOODING MAP

DRAWN	CHECKED	REVIEWED	DATE	SCALE	JOB NO.
DRC	SDS	WRS	6/30/88	AS SHOWN	883-3643

FILE NO.	DWG. NO. / REV. NO.	FIGURE
883-3643	8	4



LOCATION MAP



LEGEND

- (61cm-24") DIAMETER — CORROGATED STEEL CULVERT (NOT TO SCALE, LOCATION APPROXIMATE)
- (152cm-60") DIAMETER — REINFORCED CONCRETE CULVERT (NOT TO SCALE)
- ARROW INDICATES GENERAL DIRECTION OF SURFACE WATER RUNOFF
- APPROXIMATE BOUNDARIES OF LANDFILL
- SITE BOUNDARY
- ~100~ TOPOGRAPHIC CONTOUR: 1 METER INTERVALS

NOTE: BASE MAP PREPARED FROM FEB., 1988 AERIAL PHOTOS. DRAINAGE FEATURES PREPARED FROM BASE MAP.

SCALE IN METERS

50 0 50 100 150

1:2000

REFERENCE: JOSE LUIS IRIZARRY AND ASSOCIATES, 1987, SANITARY LANDFILL, PONCE, PUERTO RICO, DRAWING NO. C-14: AND GOLDER ASSOCIATES INC. RECONNASISSANCE SITE VISIT, 1988.

REVISIONS		
DESCRIPTION	BY	DATE

BFI OF PONCE, INC.

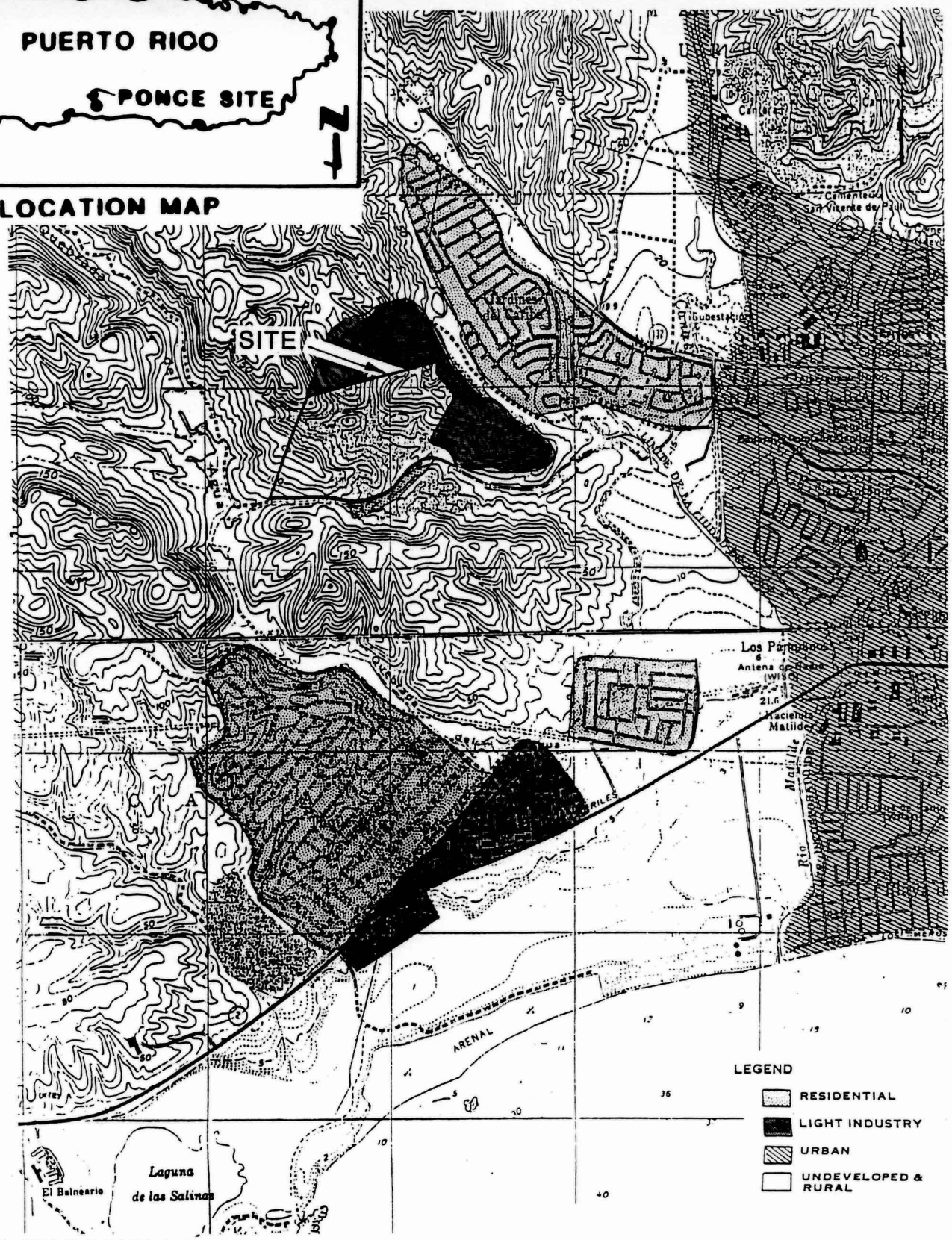
TITLE

SITE SURFACE DRAINAGE FEATURES

DRAWN	EAH	SCALE	AS SHOWN
CHECKED	AZG	REVIEWED	WRS
DATE	12/21/88		
JOB NO	883-3643		
DWG NO	36		
FIGURE	5		

Golder Associates

LOCATION MAP



REF: FROM RECRA RESEARCH, INC. RECRA PART B PERMIT APPLICATION (1984) AND GOLDER ASSOCIATES, INC. SITE RECONNAISSANCE, NOV., 1988.

Golder Associates Inc.
Atlanta, Georgia

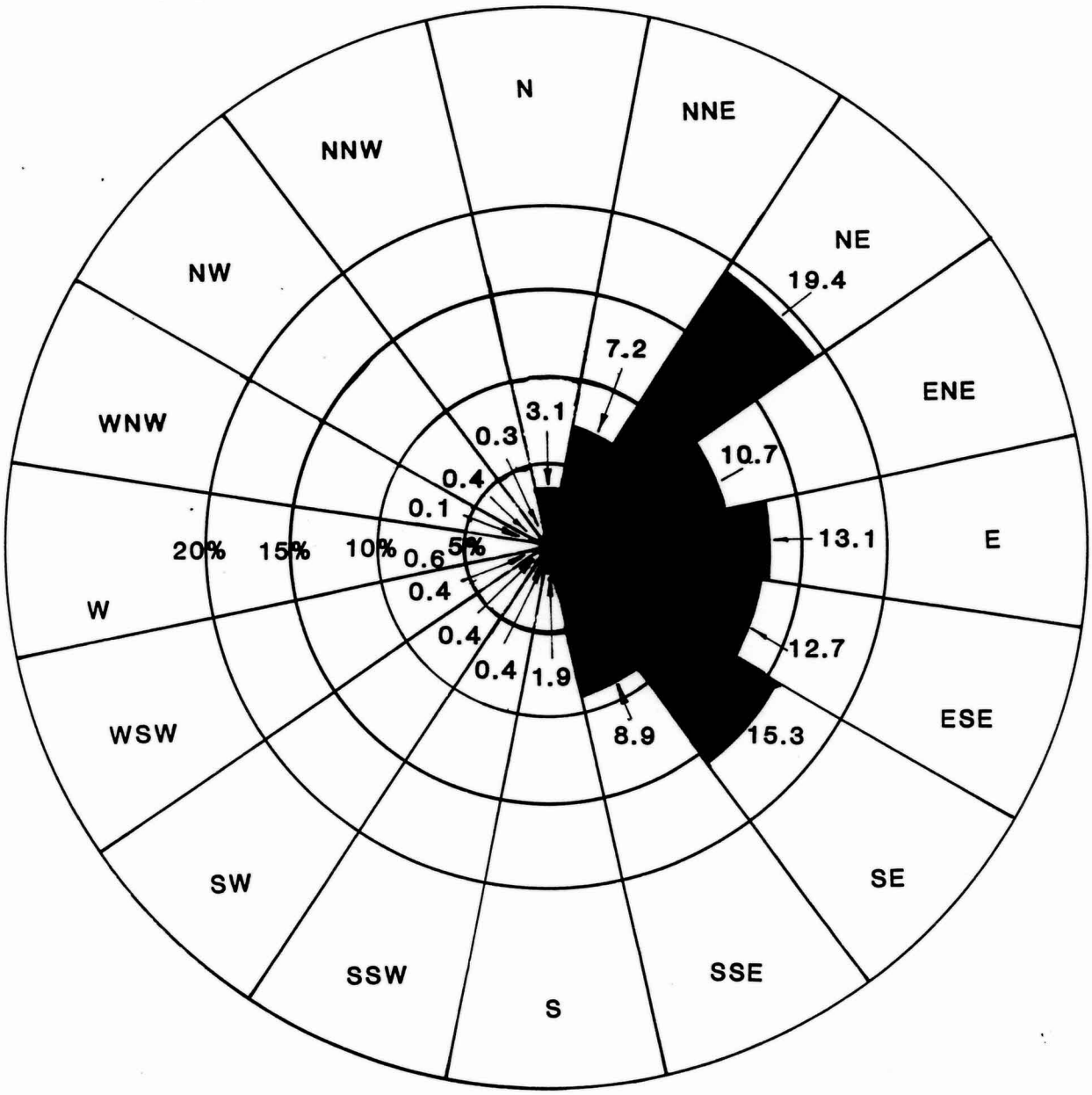
CLIENT/PROJECT
BFI OF PONCE, INC.

TITLE
SURROUNDING LAND USE MAP

DRAWN	CHECKED	REVIEWED	DATE	SCALE	JOB NO.
DRC	ALG	WRS	11/10/88	AS SHOWN	883-3643

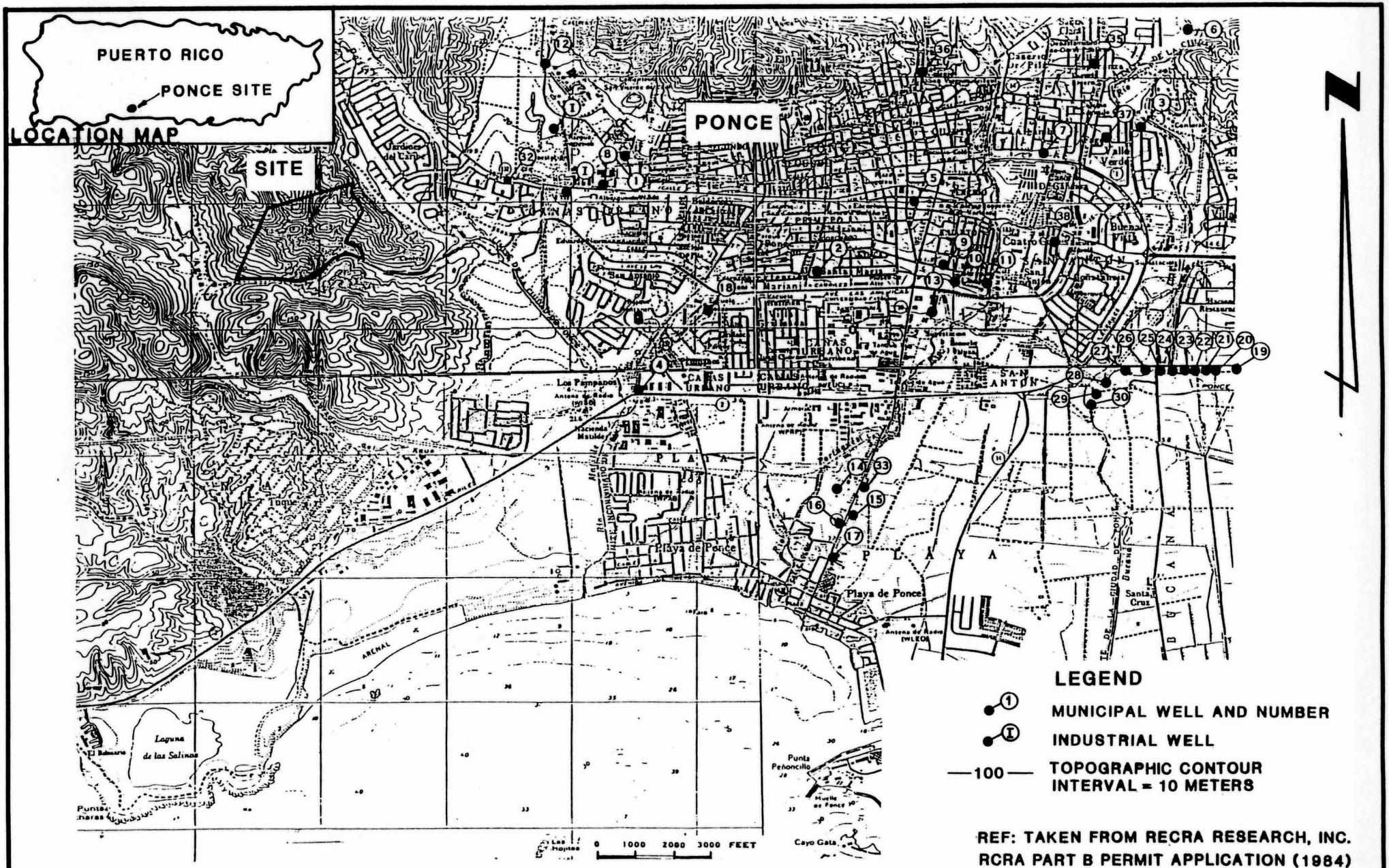
FILE NO.	DWG. NO. / REV. NO.	FIGURE
883-3643		6

CALM- 5.1%



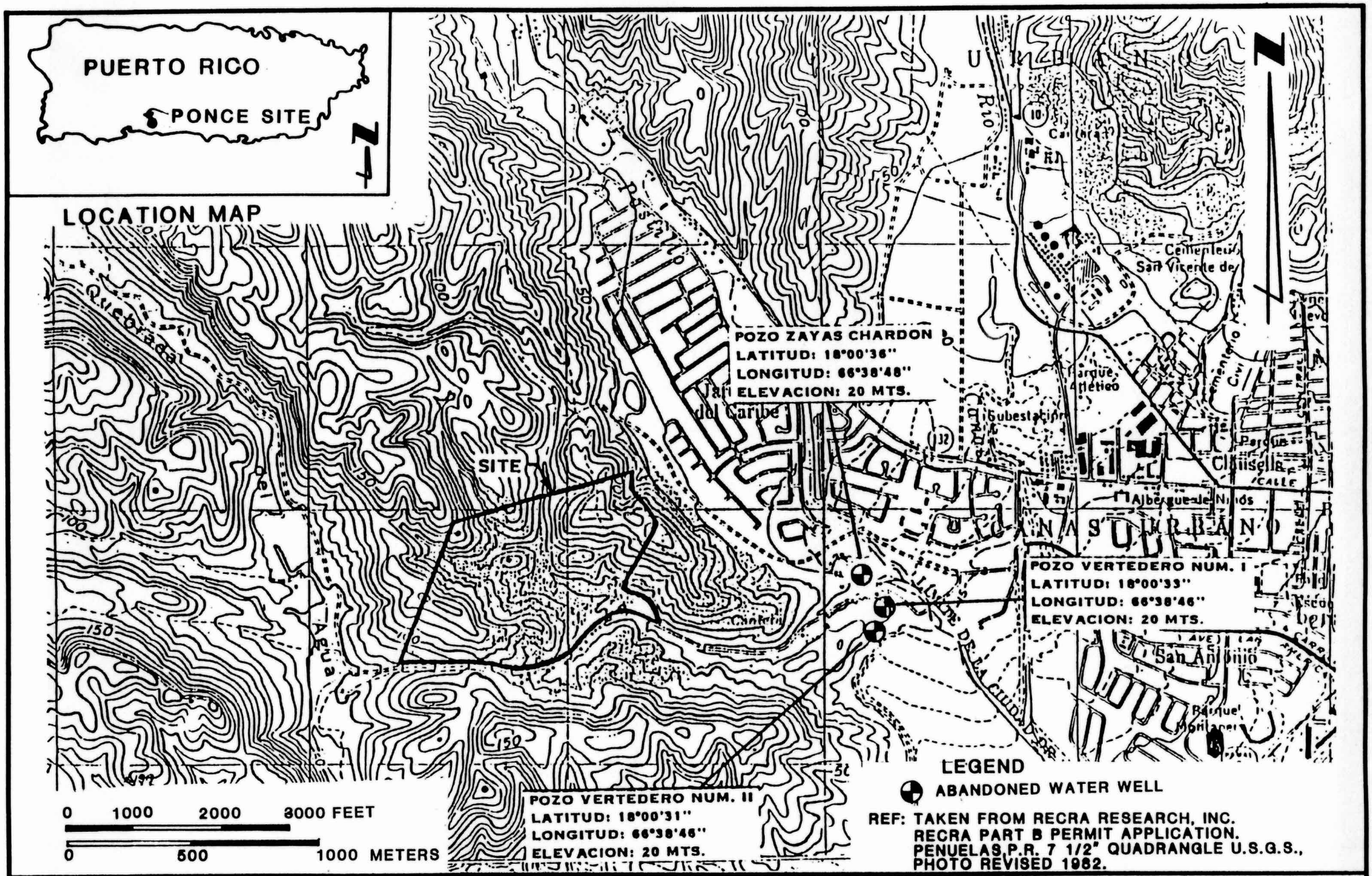
LOCATION:
PONCE, PUERTO RICO (STATION #11637)
SOURCE:
U.S. DEPT. OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
PERIOD: MARCH, 1951 THROUGH MARCH, 1954
NUMBER OF OBSERVATIONS:27,012

Golder Associates Atlanta, Georgia			TITLE WIND ROSE OF PONCE, PR.		
CLIENT/PROJECT BFI OF PONCE, INC.			DATE 11/9/88	SCALE AS SHOWN	JOB NO. 883-3643
DRAWN DRC	CHECKED ALG	REVIEWED WRS	FILE NO. 883-3643	DWG. NO. / REV. NO.	FIGURE 7



CLIENT/PROJECT: BFI OF PONCE, INC.	Golder Associates, Inc. Atlanta, Georgia					TITLE: LOCATION MAP FOR PONCE MUNICIPAL WELLS		
DRAWN: DRC	CHECKED: SDS	REVIEWED: WRS	DATE: 7/8/88	SCALE: AS SHOWN	JOB NO.: 883-3643	FILE NO.: 883-3643	DWG. NO / REV. NO.: 25	FIGURE: 8

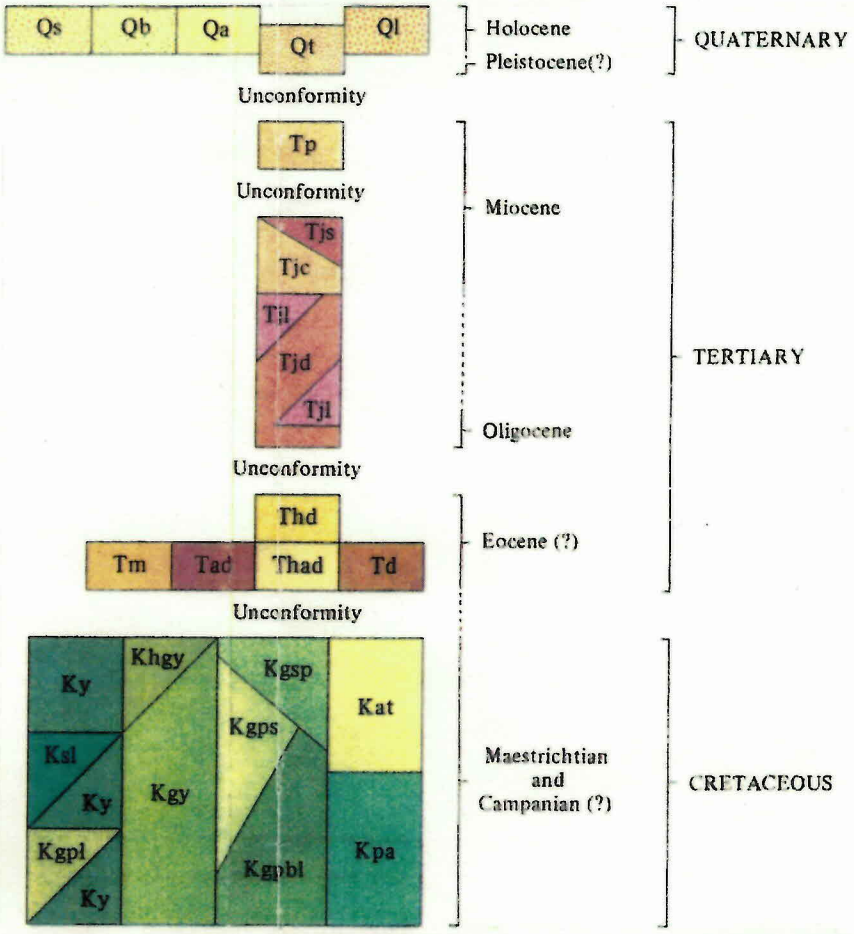
305301



CLIENT/PROJECT: BFI OF PONCE, INC.	Golder Associates Atlanta, Georgia					TITLE: ABANDONED WATER WELLS	
DRAWN: DRC	CHECKED: ALG	REVIEWED: WRS	DATE: 11/8/88	SCALE: AS SHOWN	JOB NO.: 883-3643	FILE NO.: 883-3643	DWG. NO / REV. NO.	FIGURE: 9

306457

CORRELATION OF MAP UNITS



CONTACT–DOTTED WHERE CONCEALED; QUERIED WHERE INFERRED (CONTACTS OF QUATERNARY ALLUVIAL UNITS ARE SHOWN BY A SOLID LINE BY CONVENTION; PLACEMENT RANGES FROM ASSURED TO INFERRED).

FAULT– LONG DASHED WHERE APPROXIMATELY LOCATED; SHORT DASHED WHERE INFERRED; DOTTED WHERE CONCEALED; BALL AND BAR ON DOWNTHROWN SIDE; WRENCH FAULT AND RELATIVE DIRECTIONS OF MOVEMENT SHOWN BY ARROWS; A, AWAY FROM OBSERVER; B, TOWARDS OBSERVER.

FOLDS– SHOWING CRESTLINE OR TROUGHLINE, DIRECTION AND AMOUNT OF PLUNGE IF KNOWN AND DIRECTION OF DIP OF LIMBS, LONG DASHED WHERE APPROXIMATELY LOCATED, DOTTED WHERE CONCEALED.

ANTICLINE

SYNCLINE

10 STRIKE AND DIP OF BEDS INCLINED

INCLINED CONSPICUOUS BEDS OF Kgpbl OR Kgps IN Ky.

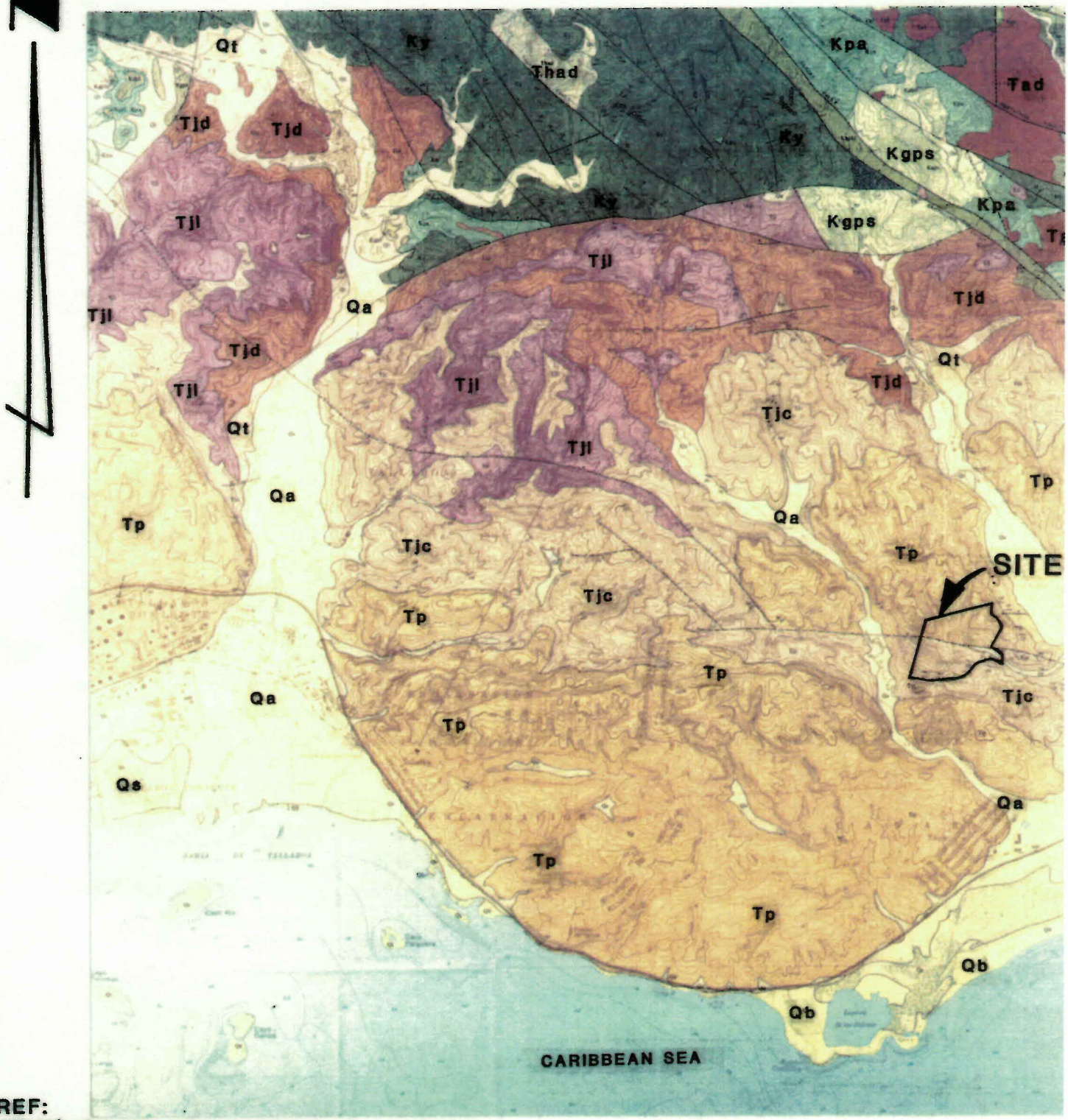
Golder Associates, Inc.
Atlanta, Georgia

CLIENT/PROJECT
BFI OF PONCE, INC.

TITLE
REGIONAL GEOLOGIC MAP

DRAWN	CHECKED	REVIEWED	DATE	SCALE	JOB NO.
DRC	SDS	WRS	6/29/88	AS SHOWN	883-3643

FILE NO.	DWG. NO. / REV. NO.	FIGURE
883-3643	5	10



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PUNTA CUCHARA (1964) TOPO QUAD MAPS.
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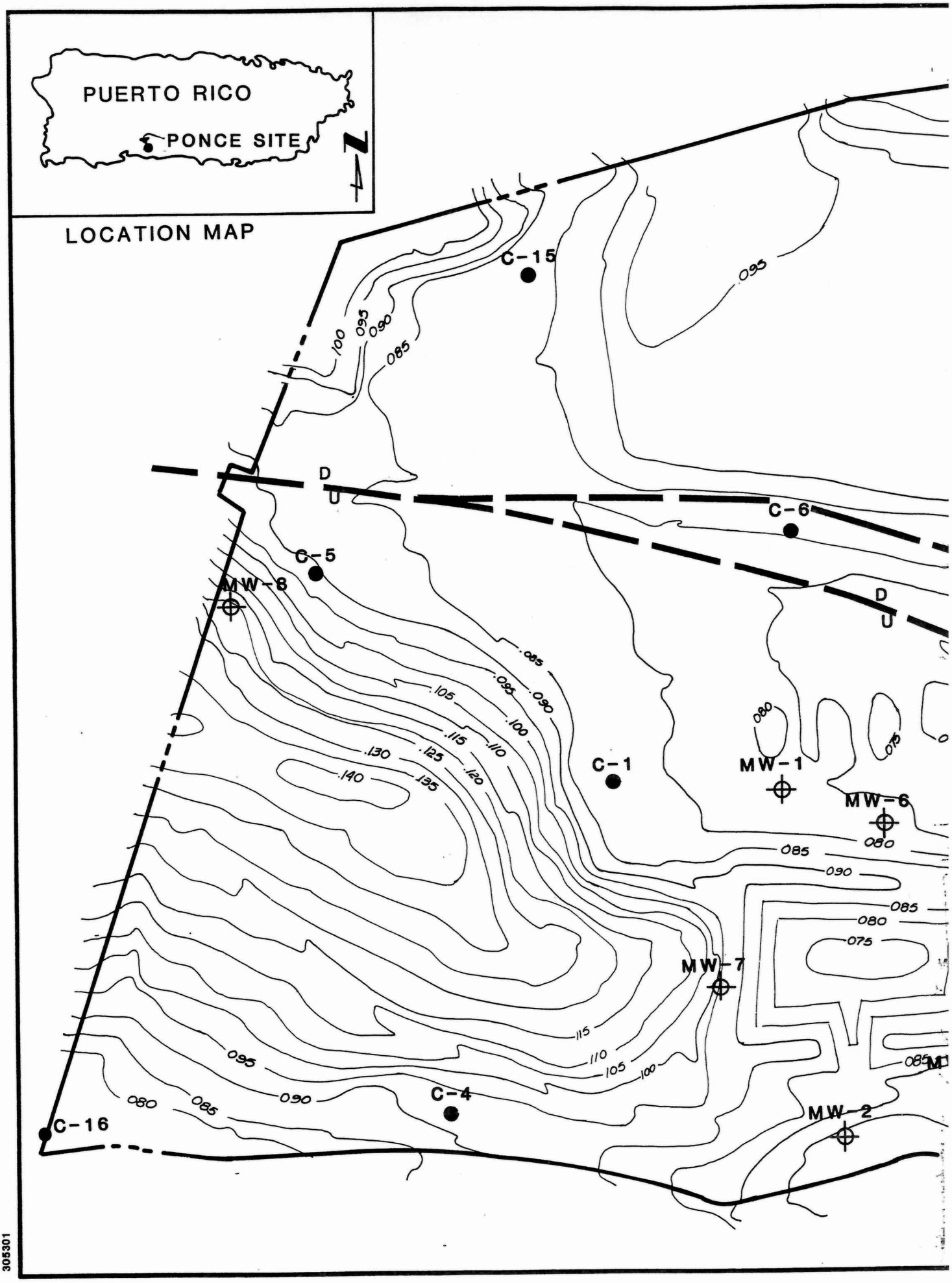
PUERTO RICO
PONCE SITE
N
LOCATION MAP
C-15
C-6
C-5
MW-8
C-1
MW-1
MW-6
MW-7
C-4
C-16
MW-2
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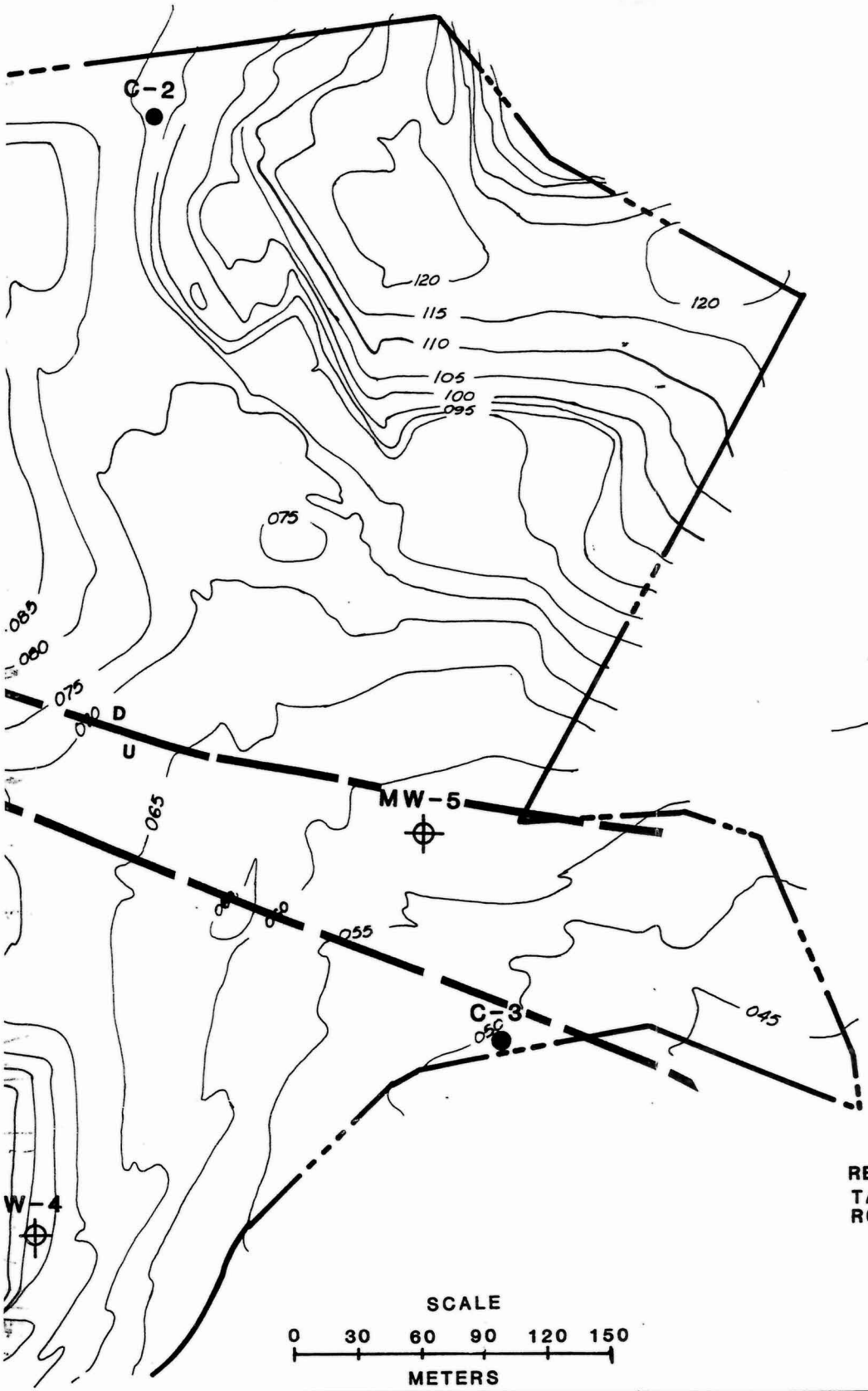

N

LEGEND

SITE BOUNDARY

100 TOPOGRAPHIC CONTOUR INTERVAL = 5 METERS

C-2 OBSERVATION WELL (LAW ENGINEERING TESTING CO., 1983a)

MW-3 MONITORING WELL (LAW ENGINEERING TESTING CO., 1983c & 1984d).

U / D FAULT (U, UPTHROWN SIDE, D, DOWNTHROWN SIDE).

REF:
TAKEN FROM RECRA RESEARCH, INC. RCRA PART B PERMIT APPLICATION.

SCALE
0 30 60 90 120 150
METERS

Golder Associates, Inc.
Atlanta, Georgia

CLIENT/PROJECT
BFI OF PONCE, INC.

TITLE
OBSERVATION AND MONITORING WELLS

DRAWN	CHECKED	REVIEWED	DATE	SCALE	JOB NO.
DRC	SDS	WRS	7/8/88	AS SHOWN	883-3643
			FILE NO. 883-3643	DWG. NO. / REV. NO. 15	FIGURE 13

Golder Associates Inc.
CONSULTING ENGINEERS

POST-CLOSURE
PERMIT APPLICATION

VOLUME II OF IV

Submitted to:

BFI of Ponce, Inc.
757 North Eldridge
Houston, Texas 77079

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Revision 1
May 1989

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ATTACHMENT 1

RCRA FACILITY ASSESSMENT
LANDFILL OPERATIONAL PRACTICE
PONCE MUNICIPAL LANDFILL
PONCE, PUERTO RICO

July 1988 883-3643

Golder Associates Inc.
CONSULTING ENGINEERS

July 22, 1988

883-3643

Browning-Ferris Industries
of Ponce, Inc.
P.O. Box 3151
Houston, Texas 77254

Attention: Mr. Bruce Jernigan
Divisional Vice President

RE: REPORT ON LANDFILL OPERATIONAL PRACTICES
PONCE MUNICIPAL LANDFILL
PONCE, PUERTO RICO

Gentlemen:

We are pleased to submit the following report on Landfill Operational Practices for the Ponce Municipal Landfill.

We appreciate the opportunity to assist BFI on this project.

Very truly yours,

GOLDER ASSOCIATES, INC.

W. R. Sullivan

W. Randall Sullivan, P.E.
Associate

WRS/r

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1.0 INTRODUCTION

This report describes operational practice at the Ponce Municipal Landfill which is operated by Browning-Ferris Industries of Ponce, Inc. (BFIP). The report has been prepared by Golder Associates, Inc. under authorization from BFIP.

This report is one of six documents requested by BFIP which form the basis of a RCRA Facility Assessment. Brief titles of the six documents are:

(i) Landfill Operational Practice

(ii) Plan for Cover Soil Sampling

(iii) Plan for Sampling of Soil Beneath Landfill

(iv) RFA Schedule

(v) Hydrogeologic Review

(vi) Groundwater Monitoring Plan

This report provides an outline of current operational practice and forms a basis for site characterization. The report includes:

- a description of the site location, history, topography, geology and climate;
- operational practice, including site facilities, the nature of the refuse, the method of placing refuse, a description of cover material used and the method of placing cover;
- surface hydrology of the site including leachate management and surface water runoff control;
- a summary of previous investigations performed in the landfill which provide characterization of the refuse; and

- an assessment of slope stability at the site including stability of natural and cut slopes and the stability of the landfill itself.

The review is based on information supplied by BFIP, discussions with BFIP personnel and reports of previous studies at the site prepared by a variety of consultants.

Previous studies referenced in this document were prepared by the following organizations:

- Cecos International, Inc.
- Recra Research, Inc.
- Law Engineering Testing Company
- M.T. Davisson, Consulting Engineer
- BFI of Ponce, Inc.

Most of the documents are included in the RCRA Part B Permit Application for a Hazardous Waste Management Facility proposed for the site. Some additional information has been obtained from BFIP documents for the site. A list of references is included at the conclusion of this report.

2.0 SITE DESCRIPTION

2.1 Site Location

The Ponce Landfill Site is located on Avenue Baramaya, Barrio La Cotorra in the south-central portion of Puerto Rico, 1 to 2 km outside the city limits of Ponce and 3 km north of the Caribbean Sea (Figure 1). The site covers an area of 51 ha (125 acres) with approximately two-thirds of the area being covered by fill or subjected to borrow excavation.

The layout of the site is shown on Figure 2, Site Plan. The approximate limits of the landfill are designated on the Site Plan, indicating filling of a valley. Site workshops, offices and other facilities are located at the eastern end of the site. An unused waste cell (Cell 1), excavated during 1983-84 is located on the south side of the site. Current borrow areas for cover material are located to the northeast and southwest of the landfill.

2.2 Site History

Site history was documented in the RCRA Part B Application by Law Engineering (1983a). Examination of aerial photographs indicated that the site was uninhabited and used as grazing land until sometime between 1936 and 1951. During that period grazing was discontinued and thick brush redeveloped.

By 1967 quarrying had taken place along the northern and southern sides of the ridge occupying the southwestern portion of the site. Some waste disposal had occurred on the site, primarily within the north-central valley.

By 1971 quarrying operations had extended to the hills on the east side of the site (in the Ponce Formation). Further random waste disposal appeared to have been taking place. By

1977 the site was being used much as it is at present with landfilling occurring throughout the central portion of the valley and cover material being borrowed from the surrounding hills. Examination of photographs from 1977 indicates that two waste lagoons were being constructed on the western edge of the site.

An oblique aerial photograph from 1983 indicates that the unused Cell 1 was under construction. Two waste lagoons, formerly operated by SK & F Industries, were evident on the western edge of the site. Closure of these lagoons was completed by September 24, 1983 in accordance with closure plans submitted to and approved by USEPA Region II.

The Ponce Municipal Landfill has been operated for disposal of municipal refuse since June 1, 1983 by Cecos International, Inc., a subsidiary of Browning-Ferris Industries, and solely by BFIP since March 1, 1987, under an agreement with the City of Ponce.

2.3 Topography

The local site topography is characterized by rugged hills in a semi-arid environment. Much of the site topography has been altered by quarrying and subsequent filling of the on-site drainage features with waste and filling. The hill in the southwest corner alone remains unchanged.

Site topographic elevations range between 40 m and 140 m (130 and 450 feet) above mean sea level (MSL). The highest part of the landfill is at an elevation of 100 m (328 feet) MSL.

Topography prior to filling is shown on Figure 3, and is based on data obtained in 1941 and 1943. This figure indicates a creek flowing from the north towards the middle of the site where it swings eastward, crossing the property boundary near the current entrance to the site.

Major drainage features in the area are the Rio Pastillo to the east and the Quebrada del Agua to the west. Both of these rivers drain southward to the Caribbean Sea. These rivers do not flow for about 70 percent of the year.

2.4 Geology

The Ponce site is located within the Southern Carbonate Province of Puerto Rico. This province is a narrow band, roughly 8 km (5 miles) wide, and extends about 50 km (30 miles) east and west of Ponce. Overlying the Cretaceous rocks of the Central Cordillera, thick carbonate sequences were deposited in this province during the mid-Tertiary age. These thick carbonate deposits were exposed by the uplift movements which began in the Pliocene and continued perhaps into the Quarternary. Quarternary alluvial deposits cover a localized area of the southern portion of the carbonate sequences.

Two formations are recognized within the south Puerto Rico Carbonate Province and both are present at the site as indicated on the Site Geologic Map (Figure 4). The Juana Diaz Formation is of mid-Oligocene to Miocene age and consists of white to brown and greyish-orange bedded calcareous arenites and siltstones with variable clay content.

The Ponce Formation is orange, very fossiliferous and porous except near the base where a hard crystalline member and a

homogenous silty member overlie the Juana Diaz beds in slight unconformity

A fault crosses the site in an east-west direction and displaces Juana Diaz beds to the south against mid-Ponce limestone to the north. It is a high-angle normal fault with at least 200 m (650 feet) of vertical displacement and possibly a left-lateral component of offset. The inferred location of this fault is shown on Figure 4. Smaller faults mapped within the Juana Diaz Formation are also shown on Figure 4.

The east-west fault divides the site into the northern half which is underlain by Ponce Formation and the southern half which is underlain predominantly by Juana Diaz Formation. However, detailed mapping of the site has revealed that the southern hills are capped by the lower Ponce beds which unconformably overlies the Juana Diaz Formation.

2.5 Climate

The climatic setting of the Ponce Landfill Site is discussed in some detail in the RCRA Part B Permit Application. The following discussion summarizes the significant climatic features of the Ponce area.

Ponce is located in the southern coastal climatological province of Puerto Rico. The dominant winds in the area are the trade winds which are principally from the northeast and southeast. About 60% of the winds have a velocity between 9 and 26 km/hr (4 and 12 mph) with an average of 11 km/hr (5 mph). The winds primarily account for the high continuous rate of evaporation at Ponce.

The rainfall precipitation patterns and quantities, as well as evaporation rates, are significantly different on the south side of the island at Ponce compared to those on the northern side of the island near San Juan.

Annual rainfall, analyzed for the years 1955-1981, yield long term precipitation on an annual basis as follows:

Years	Average Annual Rainfall
1955-1976	815 mm (32.07 inches)
1977-1981	826 mm (32.50 inches)
1955-1981	817 mm (32.15 inches)

The annual rainfall amount changes significantly from year to year (Figure 5) for the ten year period of 1972-1981. The hurricane season runs from June to mid-October and may produce up to 1000 mm (40 inches) of rain per event. Peak rainfall months for Ponce are generally from May to September.

Pan evaporation data obtained for the years 1983-1987 indicate relatively high rates, averaging nearly 1200 mm (47 inches) per year.